PUBMED and the EVIDENCE-BASED UNIVERSE

Midwest Chapter MLA
October 4, 2013

Holly Ann Burt

Outreach and Exhibits Coordinator, NN/LM GMR

Cleo Pappas

Assistant Information Services Librarian & Associate Professor, UIC LHS

INTRODUCTIONS

OBJECTIVES

- By the end of this class, attendees will be able to:
  - Define evidence based research, identify process steps and know where the library services fit
  - Recognize types of studies and understand how they relate to levels of evidence
  - Formulate literature searches to find such evidence
  - Know where to go for additional information

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Agenda

- Introductions
- Just What IS Evidence Based?
- Asking the Right Question: PICO
- Searching and Search Strategies
- Studies, Studies, Studies: Study design
- Critical Appraisal
- Taking it to the Next Level
- Evidence-Based MeSH

JUST WHAT *IS* EVIDENCE BASED?

Terminology

- Evidence-Based Medicine (EBM)
- Evidence-Based Practice (EBP)
- Evidence-Based Practice in xxx (EBPx)
- Evidence-Based Health Care (EBHC)
- Evidence-Based Nursing (EBN)
- Evidence-Based Public Health (EBPH)
- Evidence Based Library and Information Practice (EBLIP)
- Research Based Evidence (RBE)

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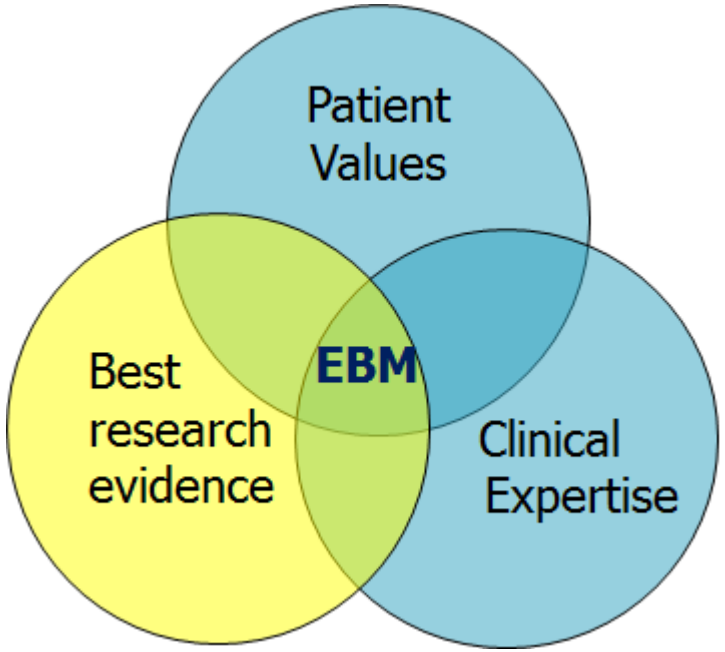
Definitions - EBM

Evidence-based medicine requires the integration of the best research evidence with our clinical expertise and our patient's unique values and circumstances.



Straus SE, et al. *Evidence-based medicine*. 2005.

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Definitions - EBPH

Evidence-Based Public Health (EBPH): The process of systematically finding, appraising and using contemporaneous clinical and community research findings as the basis for decisions in public health.

Jenicek M, Stachenko S. *Evidence-based public health, community medicine, preventive care*. 2003.

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Definitions - EBP

Evidence-Based Practice: A way of providing health care that is guided by a thoughtful integration of the best available scientific knowledge with clinical expertise. This approach allows the practitioner to critically assess research data, clinical guidelines, and other information resources in order to correctly identify the clinical problem, apply the most high-quality intervention, and re-evaluate the outcome for future improvement.

Alpha and Omega

Evidence-Based research begins and ends with a single patient in the clinical setting.

Steps in Evidence Based Practice

1. Ask an answerable clinical question (ACQ)
2. Apply the PICO format
3. Find and appraise the best evidence
4. Use that evidence in the clinical situation
5. Critically review the clinical results

Heneghan C, Badenoch D. *Evidence-based medicine toolkit*. 2007.

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Scenario

Your physician/patron (a first year resident) comes to you with the following case: a six year old male with asthma. The physician needs information regarding therapy.

Step 1 – ACQ

- Ask an answerable question – focused, searchable, clinical

Scenario

How do you treat an asthmatic child?

Step 2 – Apply PICO

- Patient, Problem, Population
- Intervention or therapy
- Comparison, Control, Context
- Outcome

Scenario: PICO

- P: child with asthma
- I: Commonly prescribed asthma medication
- C: Placebo
- O: Reduction in crises

Step 3 – Evidence

- Find the best evidence with which to answer the question through structured searches and understanding the literature
- Critically appraise the evidence for its validity (closeness to the truth), impact (size of the effect) and applicability (usefulness in clinical practice)
    - Is it valid?
    - Is it important?
    - Can it help?

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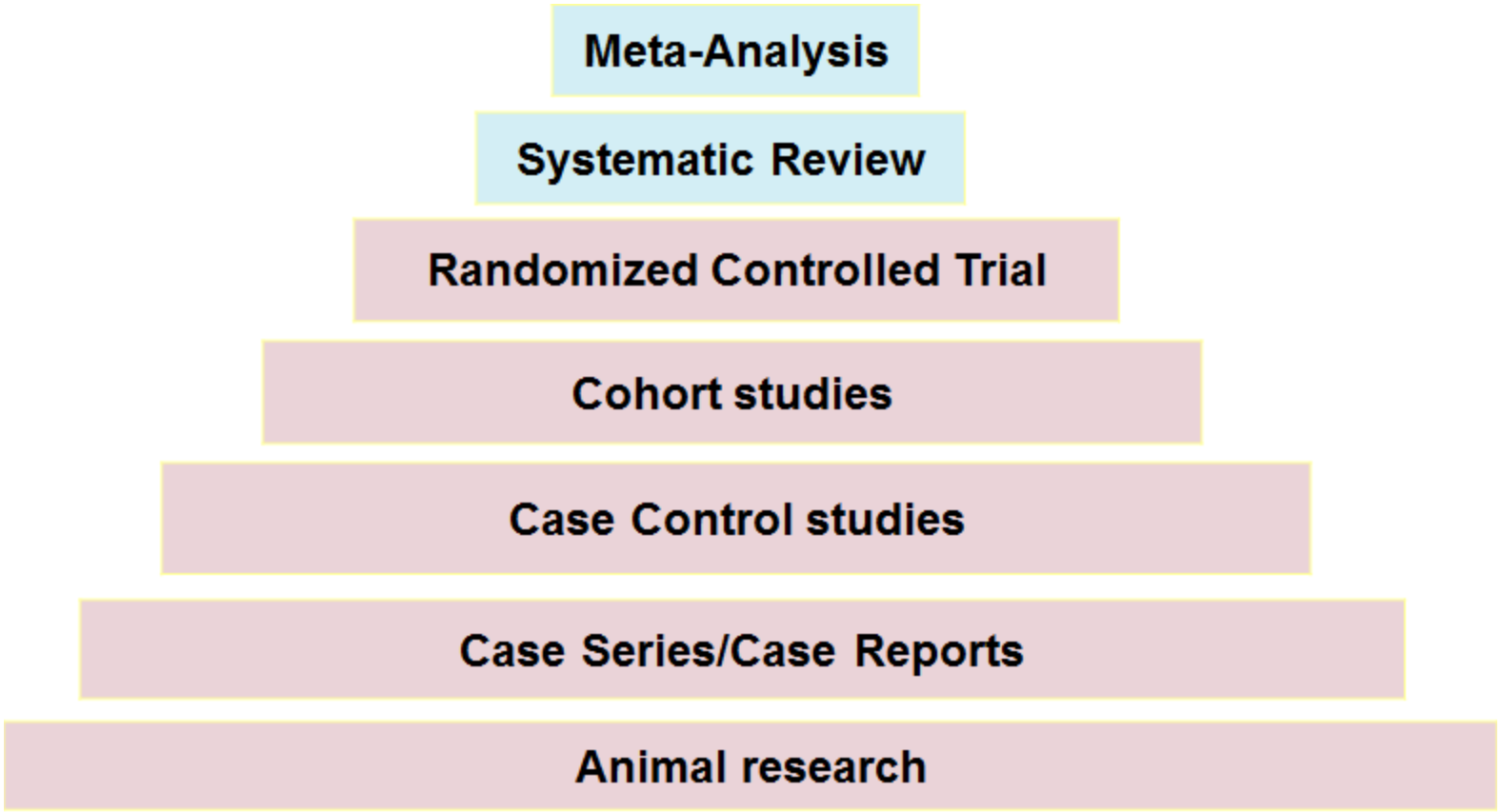
Evidence Pyramid



Clark N. *IT applications of EBM principles*. 2003.

Scenario: Search Strategy

- PubMed →
- Clinical Queries →
- Asthma →
- Therapy, narrow
- Add limits
  - Child
  - Language
  - Recent (5 years)

Castro-Rodriguez JA, Rodrigo GJ. A systematic review of long-acting ß2-agonists versus higher doses of inhaled corticosteroids in asthma. Pediatrics. 2012 Sep;130(3):e650-657. PMID: 22926172.

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Structured Abstract

- Background: The purpose or hypothesis of the study
- Methods: A description of the population studied (size, important eligibility criteria, selection process) and the methods used to conduct the research (including study design and measures employed)
- Results: A statement of the primary results of the study with the types of analyses indicated and appropriate levels of statistical significance and confidence intervals
- Conclusion: A statement of the conclusions answering the hypotheses or research question posed at the beginning of the study.

Step 4 - Application

- Use that evidence in the clinical situation
- Applying a decision - Combining findings to make a recommendation, placing the evidence into context, incorporating recommendation into a specific patient situation, clinical setting or organization
  - How much will it help a patient or population?
  - Does it meet their values and goals?
  - Is it cost-effective?

Step 5 - Evaluation

- Evaluation - Determining and measuring the effectiveness of the practice change over time
  - What is the outcome of using (or not using) particular information and its impact on clinical practice?

Heneghan C, Badenoch D. 2007.

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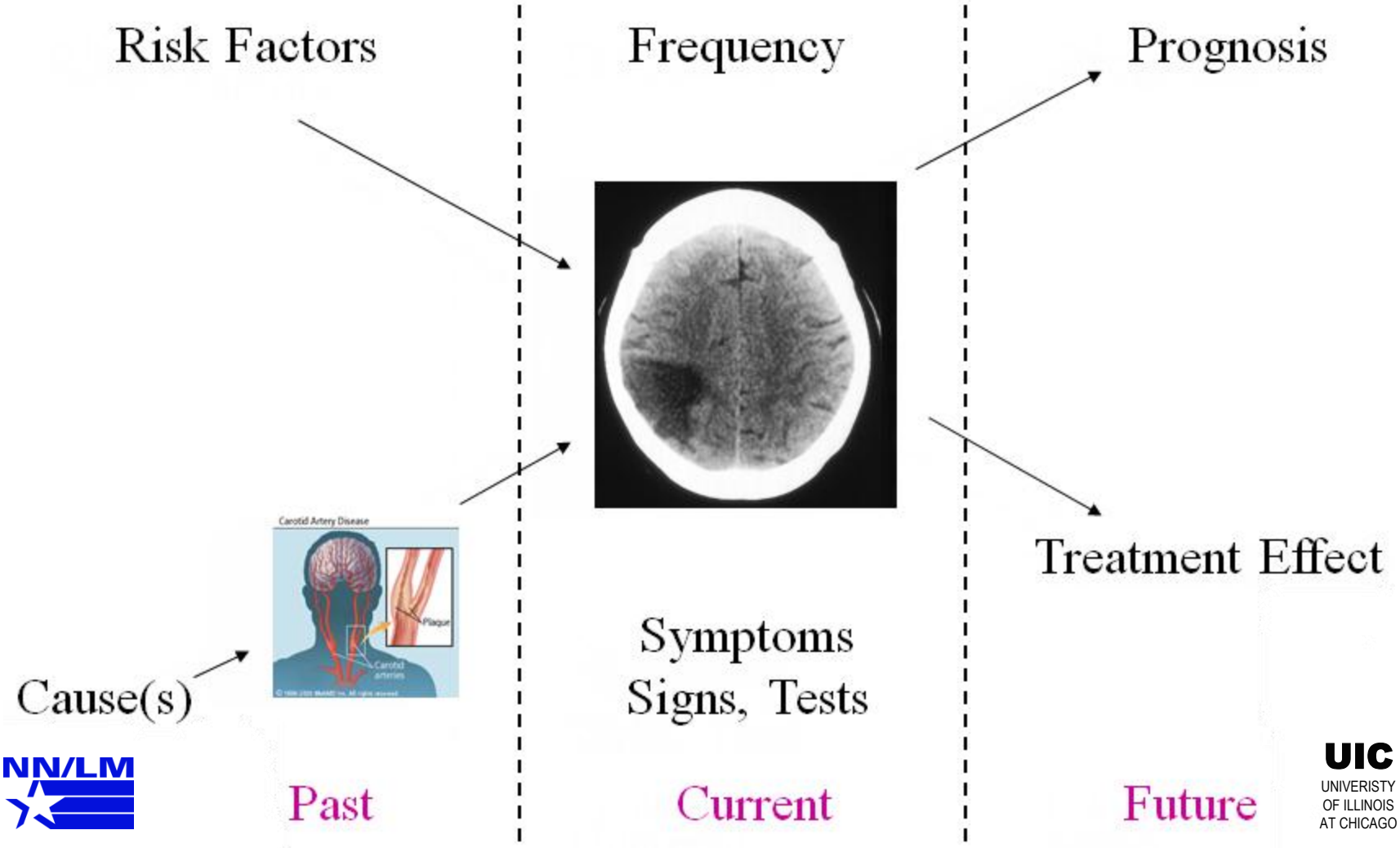
Steps in Evidence Based Practice

1. Ask an answerable clinical question (ACQ)
2. Apply the PICO format
3. Find and appraise the best evidence
4. Use that evidence in the clinical situation
5. Critically review the clinical results

ASKING THE RIGHT QUESTION

My Brother Died of Stroke, Will I?

Glasziou P. *Why bother with evidence-based practice? 2010.*



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PICO Questions

- PICO
  - Patient, Problem, Population (subjects)
  - Intervention or therapy – may include coalition-building and/or collaborative programs (study groups)
  - Comparison, Control, Context
  - Outcome (results)

PICO Practice Suggestions

- What therapy is recommended for a preemie who is experiencing seizures?
- What is the prognosis for gastroischisis?
- What is the therapy for Coagulase-negative staphylococci (CoNS)?
- What is the therapy for omphalitis?
- Something personal to you

PICO Practice

- Small Groups
- Develop a PICO Question
- Share with the class
- Guidelines:
  - Develop an ACQ
  - Apply the PICO format

Searching and Search Strategies

Searching for studies – Credit Notice

This section has been adapted from

Searching for Studies

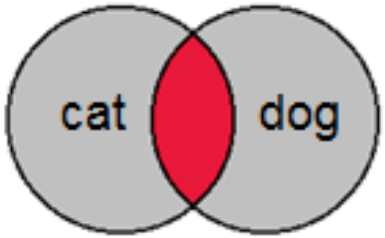
Karianne Hammerstrøm

Information Retrieval Specialist

The Campbell Collaboration

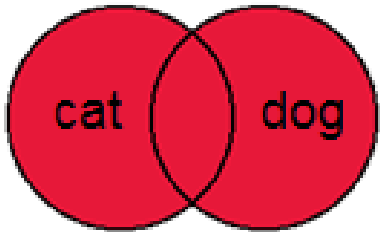
Boolean Searching

- cat AND dog



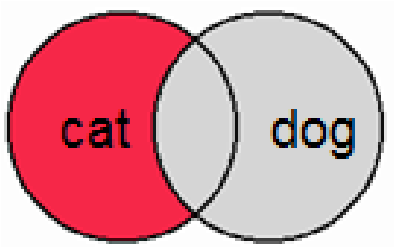
Both words must be present in the document

- cat OR dog



Either one (or both) of the words must be present in the document

- cat NOT dog



You want to find documents which contain the first word, but NOT the second word

Remember: "Or is More"

Create a Search Log

Database	Date	Terms	#Relevant	#Irrelevant	Notes

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Pappas. 2013

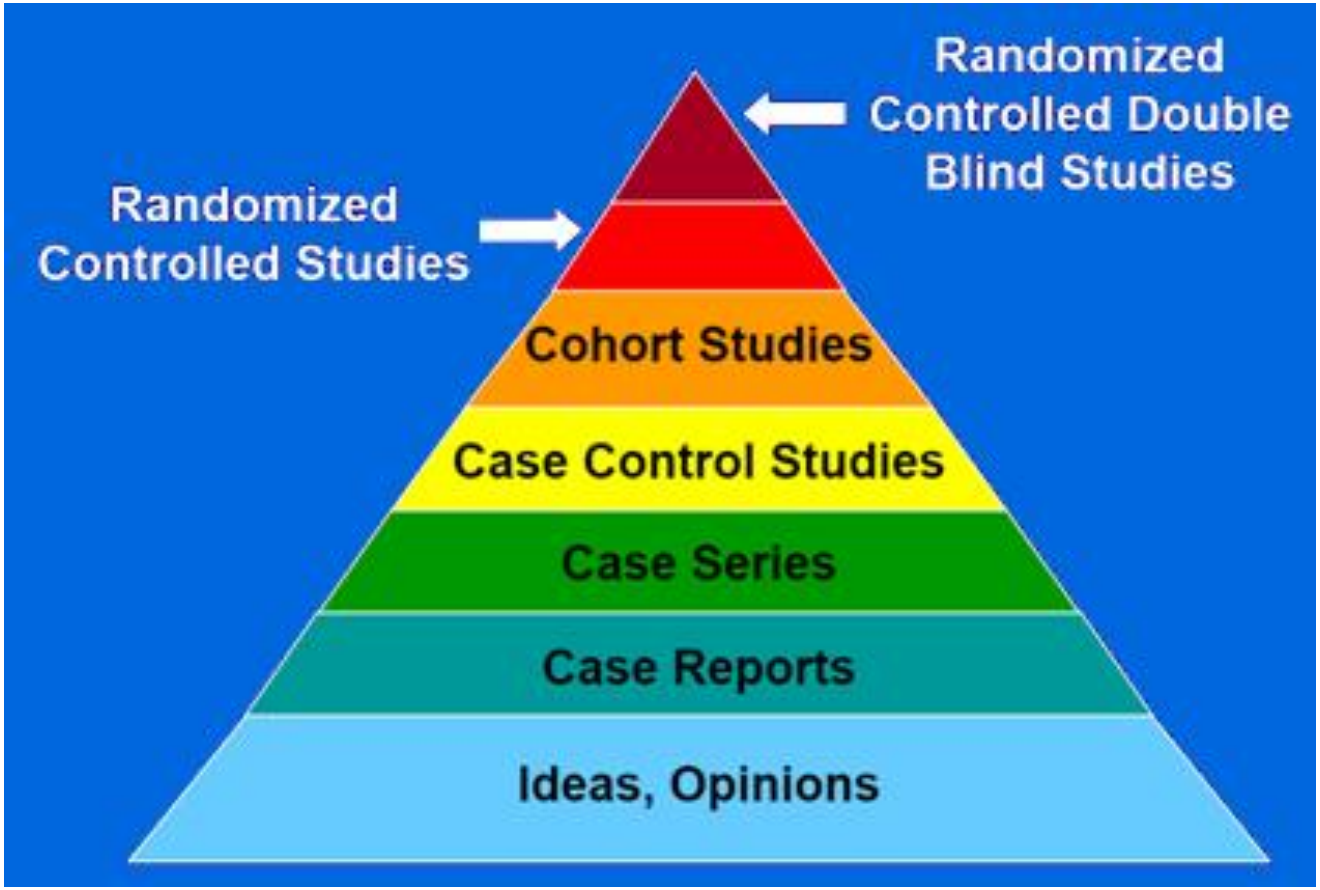
STUDIES, STUDIES, STUDIES

Identifying the Best Study

Type of Question	Suggested best type of Study
Therapy	RCT>cohort > case control > case series
Diagnosis	Prospective, blind comparison to a gold standard
Etiology/Harm	RCT > cohort > case control > case series
Prognosis	Cohort study > case control > case series
Prevention	RCT>cohort study > case control > case series
Clinical Exam	Prospective, blind comparison to gold standard
Cost	Economic analysis

Introduction to Evidence Based Medicine. UNC-Chapel Hill. 2004.

Levels of Evidence (Studies)

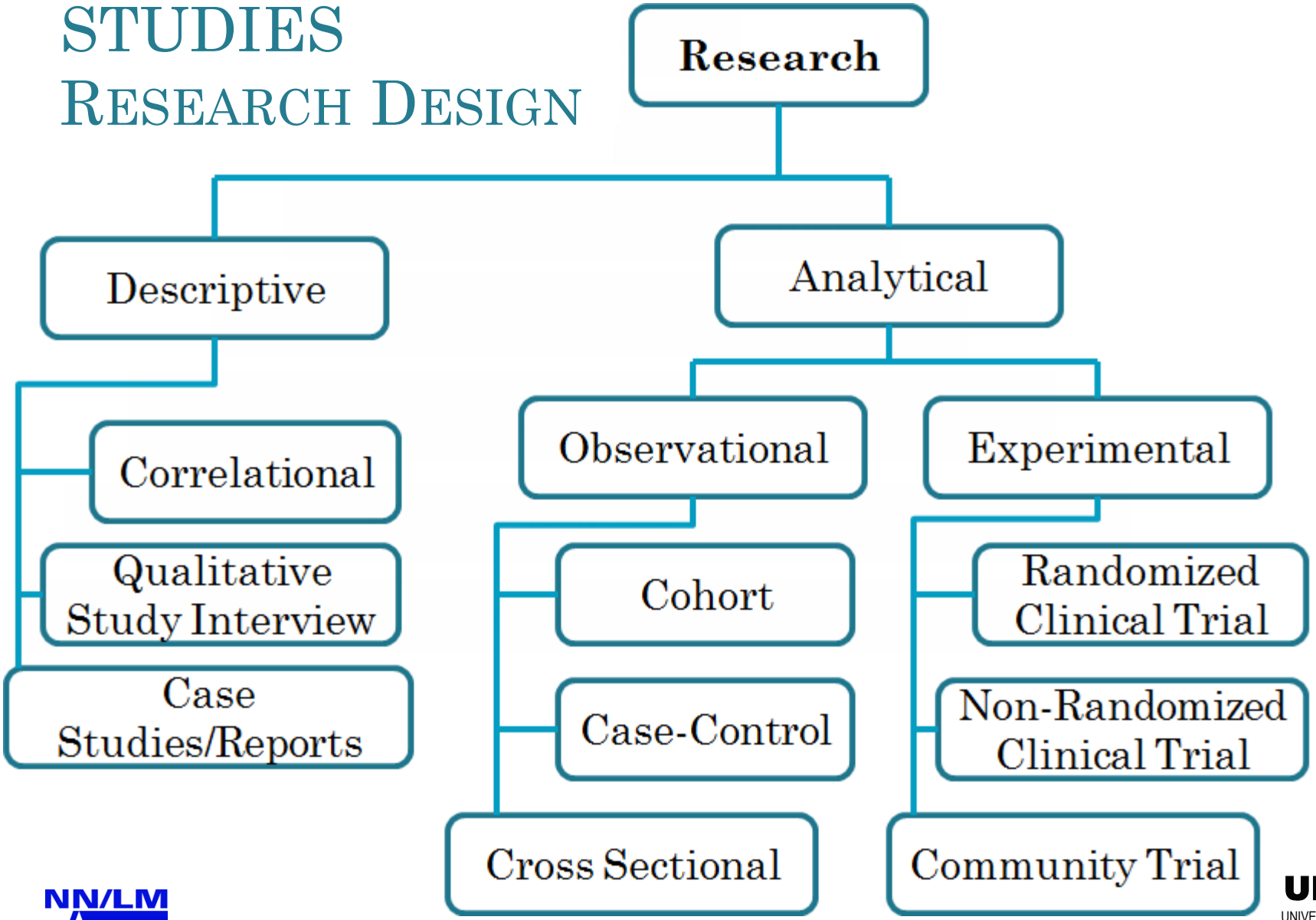


Kramer BS. *Weighing scientific evidence*. 2009.

Studies Introduction

- You can think of studies using two very broad categories:
  - Interventional
  - Observational
- Ethical issues sometimes determine what investigators can use

STUDIES
RESEARCH DESIGN



Cambron JA. *Study design*. 2008.

STUDIES
RESEARCH DESIGN – DESCRIPTIVE

- Investigator studies people and exposures in nature, observational
- No control or comparison group
- Studies
  - Correlational – statistical association between variables
  - Case studies – new diseases & treatments, etc.
  - Case report – documenting research's experience
  - Case series – following a group over time
  - Cross sectional study – survey
    - Community Survey
  - Qualitative study– interview w/open-ended question
  - Migrant studies

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STUDIES
RESEARCH DESIGN – ANALYTICAL OBSERVATIONAL

- Investigator collects data without making changes to patient's life or introducing treatments
- Control/Comparison group, not randomized
- Studies
  - **Case Control** – etiology; examine associations between disease/disorder/health issue and one or more risk factors
  - **Cohort Study** – measurement of one characteristic, outcome, or issues across two groups
    - Prospective Cohort
    - Retrospective Cohort
    - Time Series Study
  - **Cross sectional** – to determine prevalence

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STUDIES
RESEARCH DESIGN – ANALYTICAL EXPERIMENTAL

- Investigator chooses and tests intervention, treatment or exposure
- Decision as to group allocation can be by either random or non-random methods
- Control and/or comparison group used
- Note: Random allocation of subjects to is used to reduce selection bias by investigator and evenly allocate subjects on basis of known and unknown characteristics

STUDIES
RESEARCH DESIGN – EXPERIMENTAL STUDIES

- Studies
  - Clinical trials
    - **Non-randomized trials** (quasi-experiment)
      - Interrupted time series
    - **Randomized Controlled Trials** (RCT)
      - Double-blind randomized trial
      - Single-blind randomized trial
      - Non-blind trial
      - Crossover trial (may also be observational)
  - Community trials – conducted directly through doctors and clinics
  - Laboratory trials

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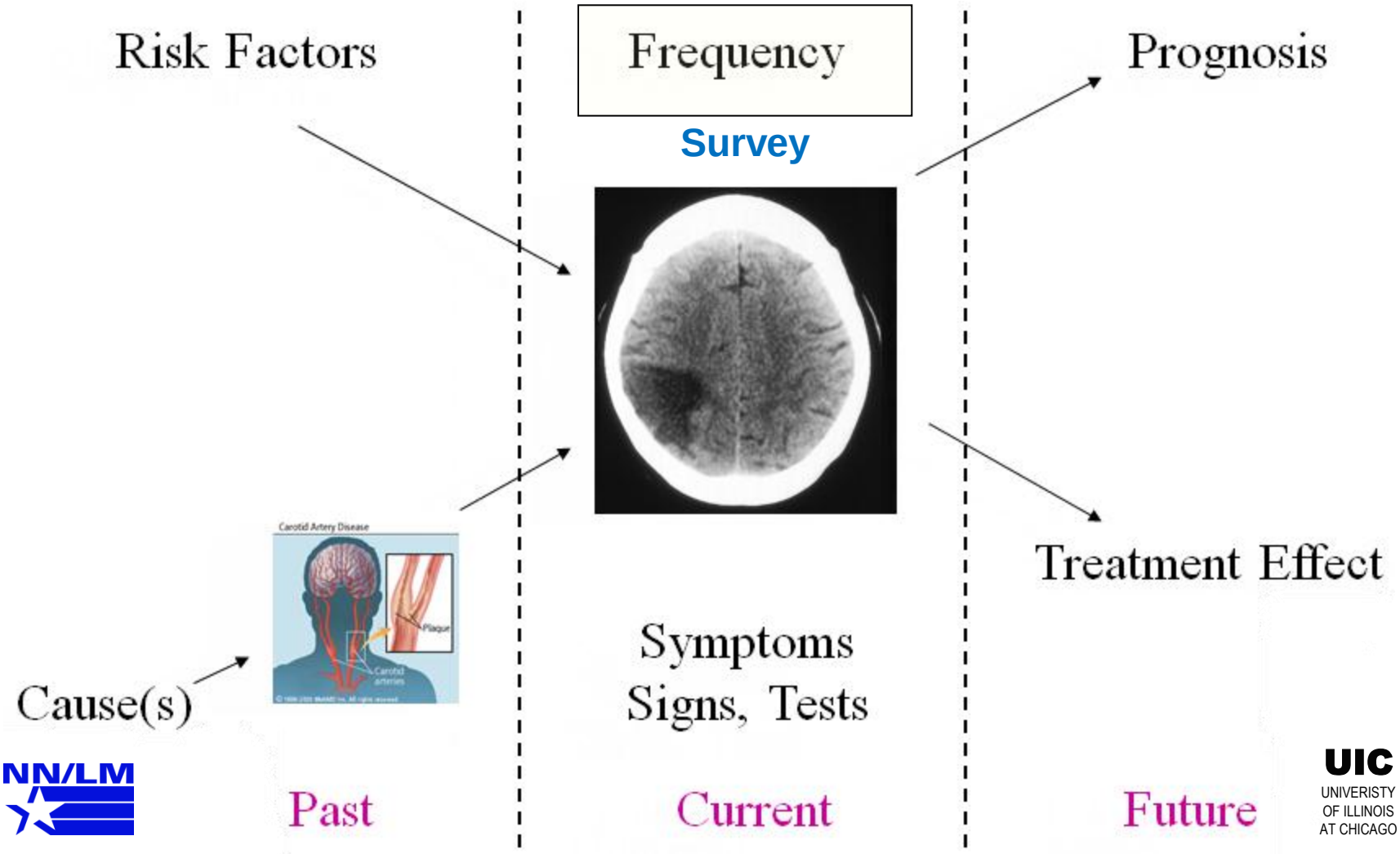
Brother Died of Stroke, Will I?

Glasziou P. 2010.



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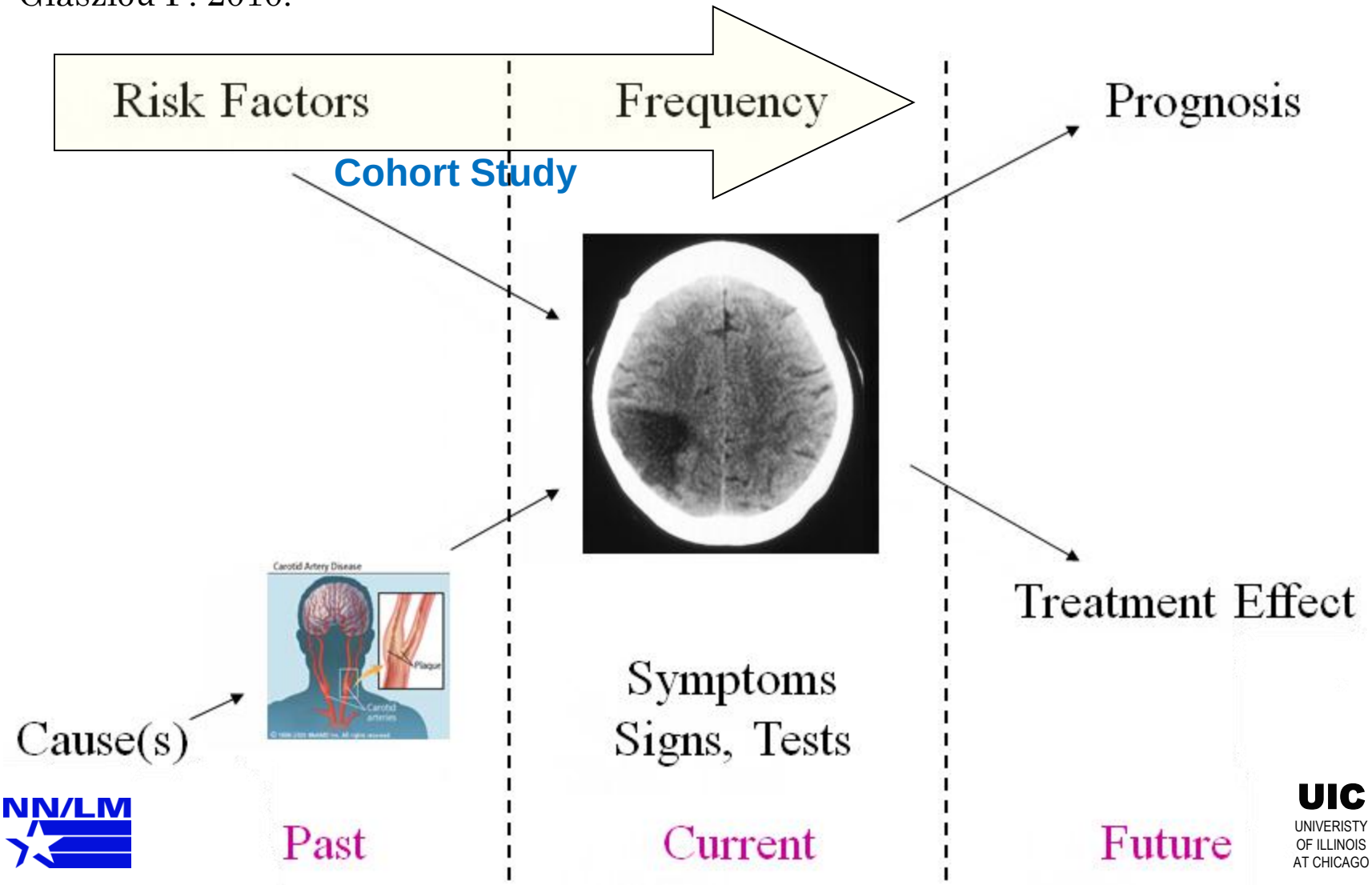

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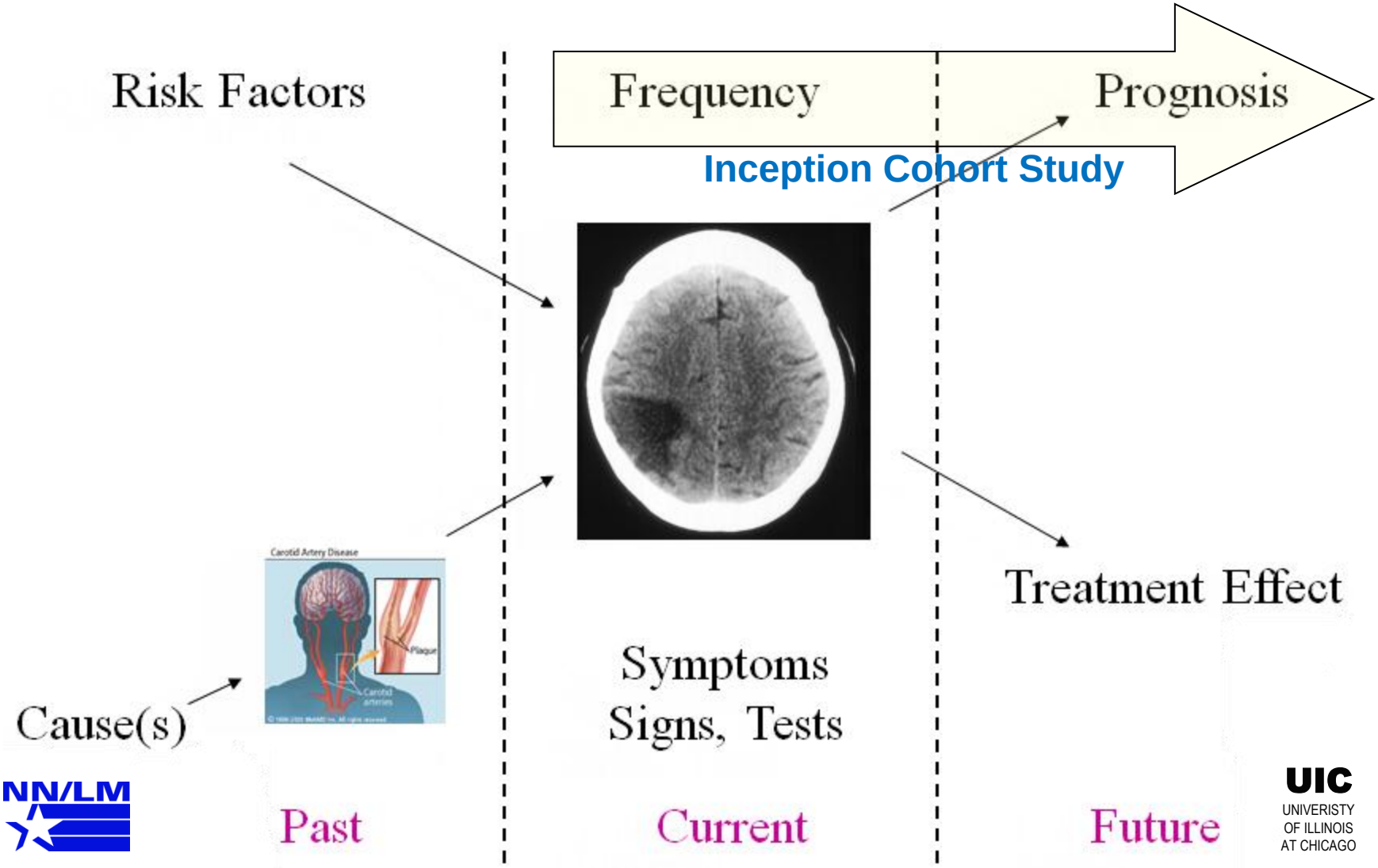

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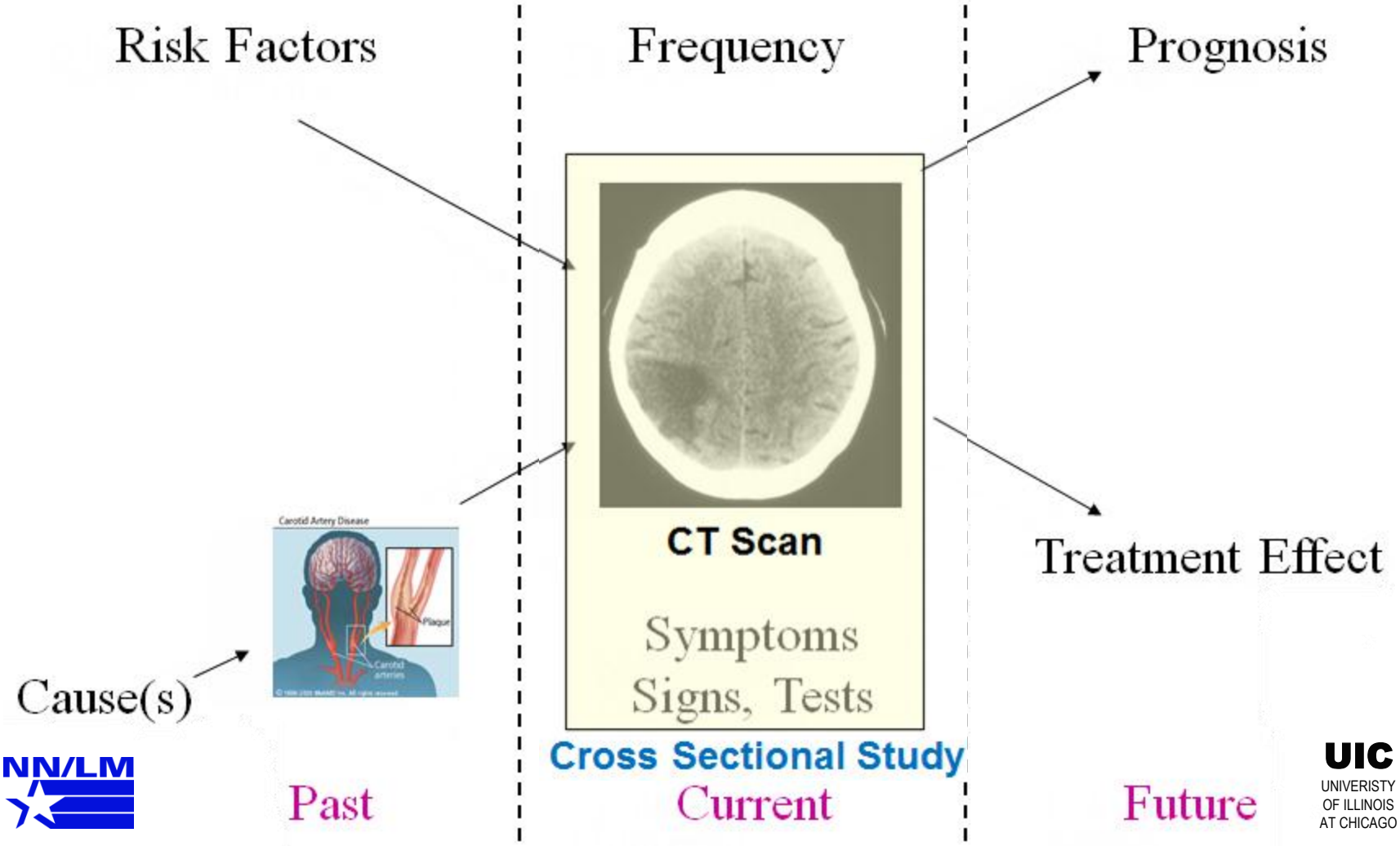

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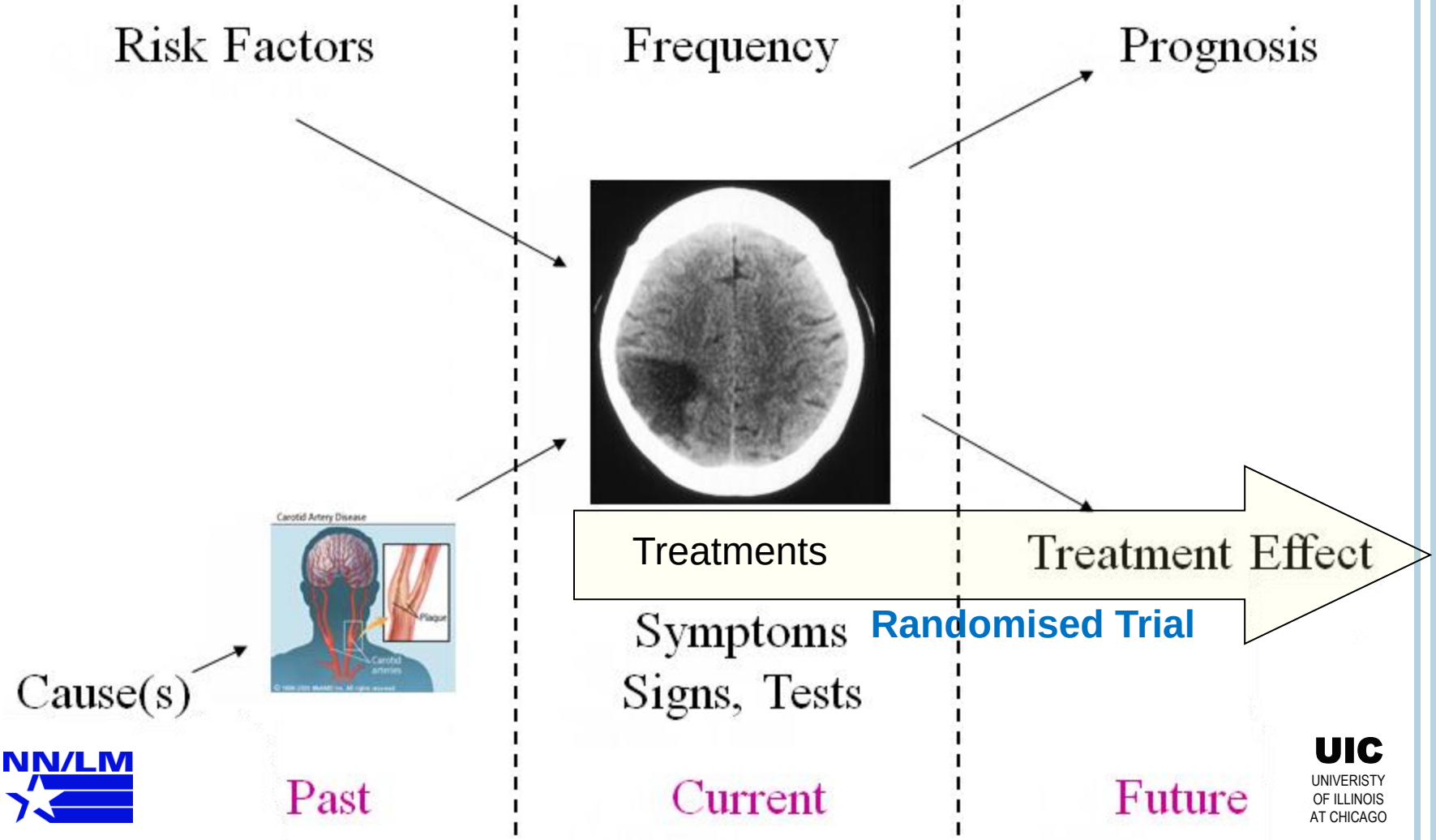

STUDIES - RCT
RANDOMIZED CONTROL TRIAL

- Gold standard – especially for therapy studies
- Participants are randomly allocated into intervention (treatment) and control (placebo)
  - Phase I Clinical Trials – Healthy subjects
  - Phase II Clinical Trials – Small group
  - Phase III Clinical Trials – Large group prior to marketing
  - Phases IV Clinical Trials – Post-marketing study
- Rigorous evaluation of a single variable
- Seeks to falsify (rather than confirm) it's own hypotheses

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Elements to Examine in an RCT

- Validity
- Reliability
- Intention to Treat
- Sample Size
- Control Group
- Randomization
- Blinding, Double Blinding, Triple Blinding
- Bias
- Confounding

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Validity

- Internal Validity
  - Does the study answer the question it purports to answer?
- External Validity
  - Can the study be generalized or extrapolated to the entire population from which the sample was drawn?

Elements of Internal Validity

- **Temporal**: the result occurs *AFTER* the intervention
- **Selection:** biases resulting from method used to select participants and to assign them to experimental or control group
- **Intention to Treat:** Individuals are analyzed in the group to which they are initially assigned regardless of their participation
- **Dose Response Gradient:** the effect increases with an increase in the intervention

Bias Noted/Avoided/Corrected

- Randomization: method of randomization should be reported
- Blinding: single, double, triple
- Intention to treat: “Analyze where you randomize”
- Intention to treat: Replicates the reality of clinical situations where participants do not do what they are told or do not report accurately

Examine Randomized Control Trials

- In small groups, select one of these RCTs and examine it in light of these elements
  - PMID: 17088514
  - PMID: 23380178 (use abstract only)
  - PMID: 22909281
- What issues have you uncovered?
- What questions did you ask?

Critical Appraisal

Critical Appraisal - Focus

- Analysis of the article you chose to answer your PICO question

Critical Appraisal Questions

- Is the study appropriate for my patient?
- What were the results?
- Are the results important?
  - Statistical significance
  - Clinical significance
- Will the results help me in caring for my patients

Heneghan C, Badenoch D. 2007

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Critical Appraisal Topic (CAT)

- Look up article
- In groups complete the Critically Appraised Topic (CAT) checklist

  - PMID: 21311842

Reporting Standards

- CONSORT – Consolidated Standards of Reporting Trials (http://www.consort-statement.org/)
- MOOSE – Meta-analysis of Observational Studies in Epidemiology
- QUORUM – Quality of Reporting for Meta-analysis
- STROBE – Strengthening the Reporting of Observations Studies in Epidemiology (http://www.strobe-statement.org/)

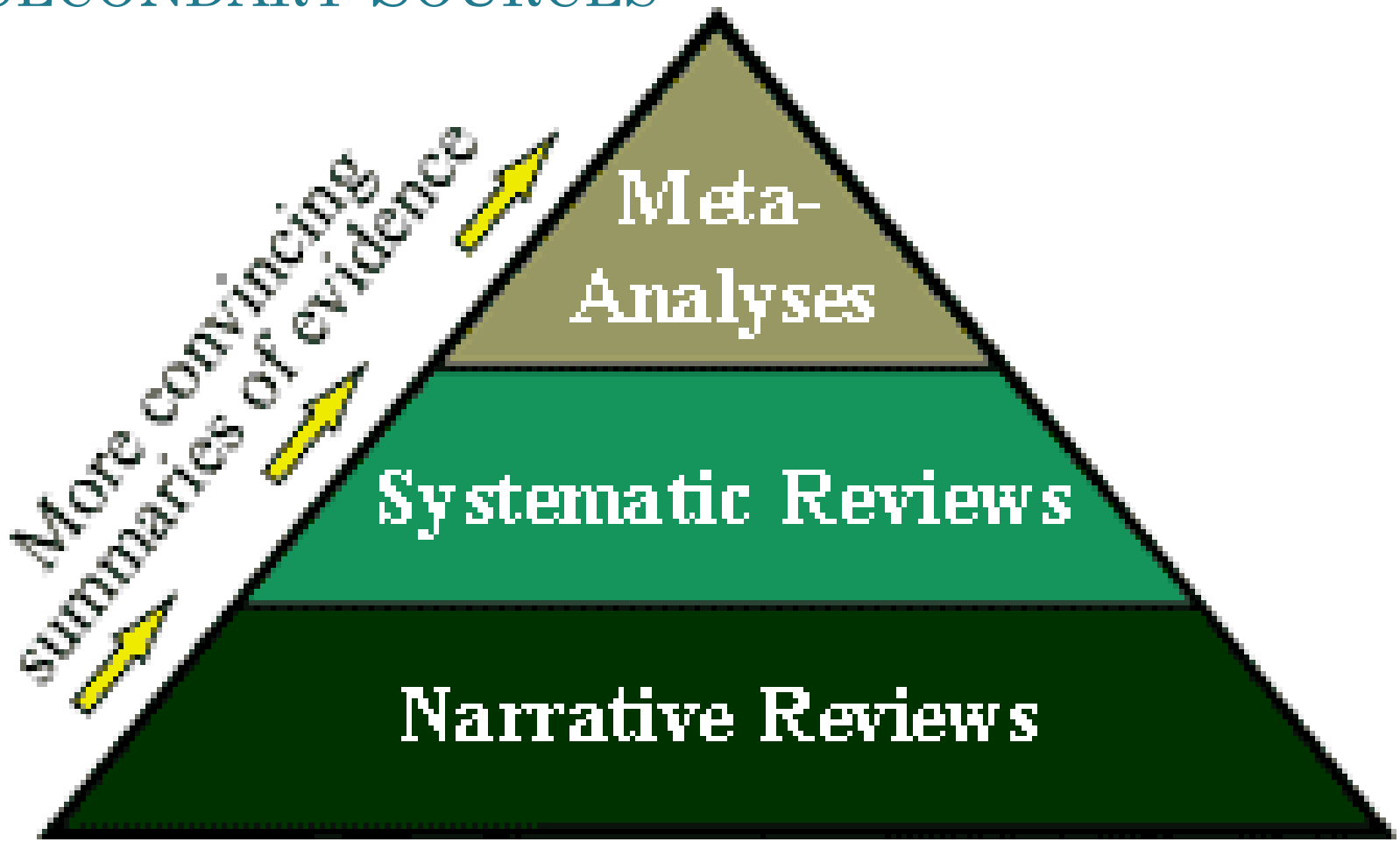
Brand RA. Standards of reporting. 2009.

In Depth Analysis

- Use the CONSORT Checklist to analyze the following article
  - PMID: 15383514
- Identify the PICO question

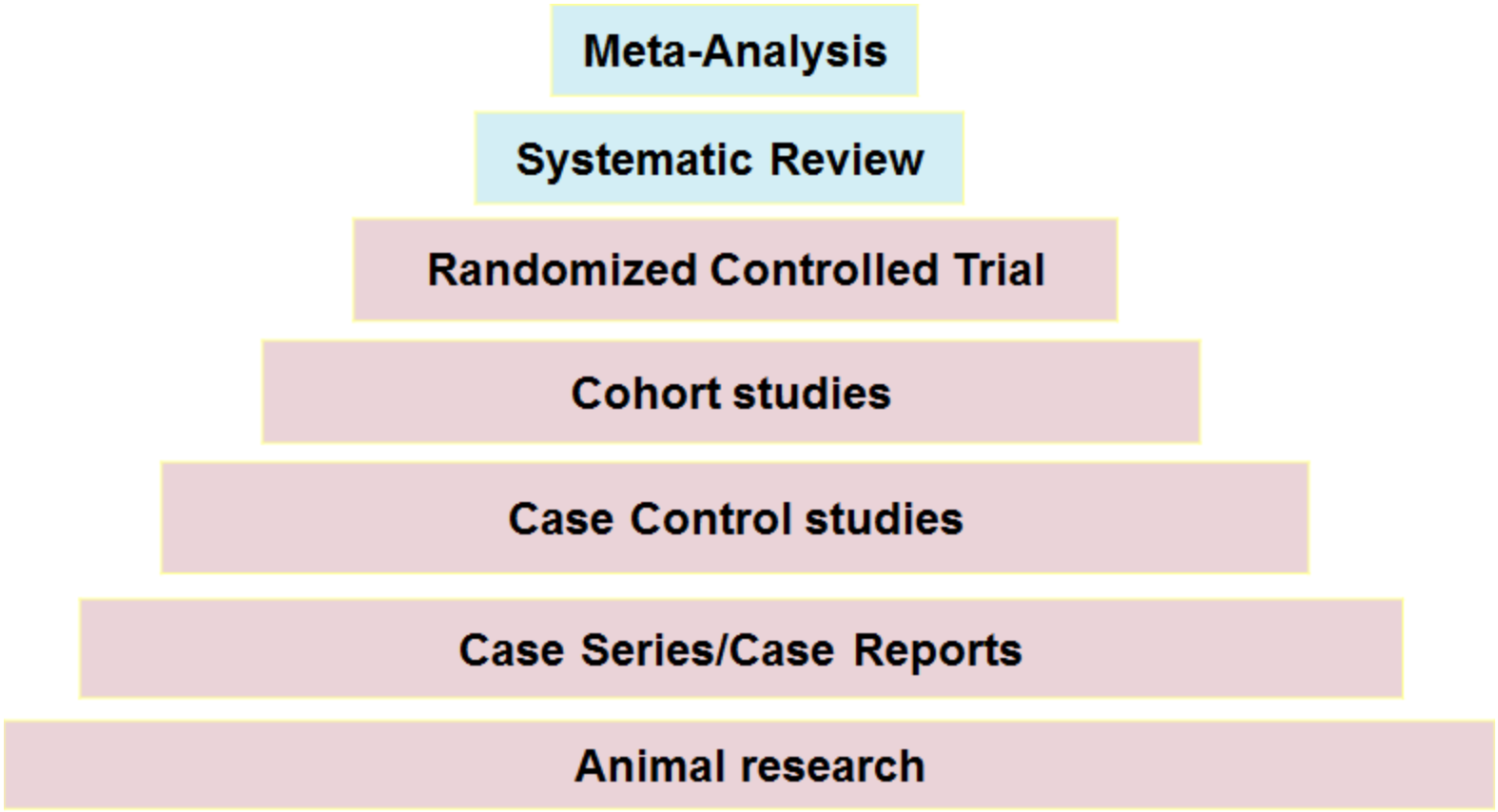
Taking it to the Next Level

Secondary Sources



Clark N. 2003

Evidence Pyramid



Clark N. 2003

HOWEVER:

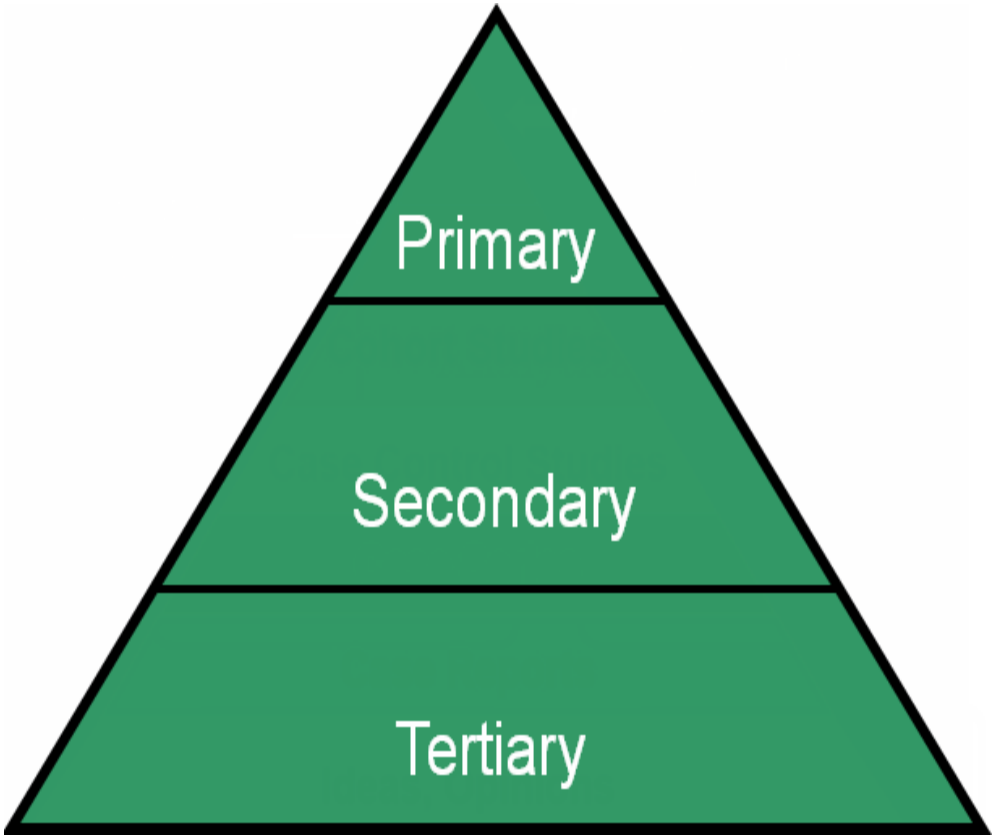
- The types of studies that give the best evidence are different for the different types of questions
- In every case, the best evidence comes from studies where the methods used maximize the chance of eliminating bias

Glasziou P, Del Mar C. *Evidence-based practice workbook.* 2007.

Identifying the Best Study

Type of Question	Suggested best type of Study
Therapy	RCT>cohort > case control > case series
Diagnosis	Prospective, blind comparison to a gold standard
Etiology/Harm	RCT > cohort > case control > case series
Prognosis	Cohort study > case control > case series
Prevention	RCT>cohort study > case control > case series
Clinical Exam	Prospective, blind comparison to gold standard
Cost	Economic analysis

Levels of Peer Reviewed Information



- *Primary*: original research
- *Secondary:* review articles
- *Tertiary:* textbooks, summaries

Clark N. 2003

Review

- Review of a body of data that uses explicit methods to locate primary studies and explicit criteria to asses their quality
- PubMed: Review [PT]

Systematic Review

- Review of a body of data that uses explicit methods to locate primary studies and explicit criteria to asses their quality
- PubMed: No separate MeSH heading; use the Systematic Review option in Clinical Queries

Meta-Analysis

- Works consisting of studies using a quantitative method of combining the results of independent studies (usually drawn from the published literature) and synthesizing summaries and conclusions which may be used to evaluate therapeutic effectiveness, plan new studies, etc.
- A statistical analysis combining or integrating the results of several independent clinical trials considered by the analyst to be "combinable" usually to the level of re-analysing the original data. Pooling, quantitative synthesis.
- PubMed MeSH: Meta-Analysis [PT]

EVIDENCE BASED MESH

Clinical Queries

- Search by Clinical Study Category
  - Category
    - Etiology
    - Diagnosis
    - Therapy (default)
    - Prognosis
    - Clinical prediction guides
  - Scope
    - Narrow specific search
    - Broad sensitive search (default)
- Systematic Reviews
- Medical Genetics Searches

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Filters Used in Clinical Queries

Category	Optimized For	Sensitive/ Specific	PubMed Equivalent
therapy	sensitive/ broad	99%/70%	((clinical[Title/Abstract] AND trial[Title/Abstract]) OR clinical trials[MeSH Terms] OR clinical trial[Publication Type] OR random*[Title/Abstract] OR random allocation[MeSH Terms] OR therapeutic use[MeSH Subheading])
therapy	specific/ narrow	93%/97%	(randomized controlled trial[Publication Type] OR (randomized[Title/Abstract] AND controlled[Title/Abstract] AND trial[Title/Abstract]))

http://www.ncbi.nlm.nih.gov/books/NBK3827/#pubmedhelp.Clinical_Queries_Filters

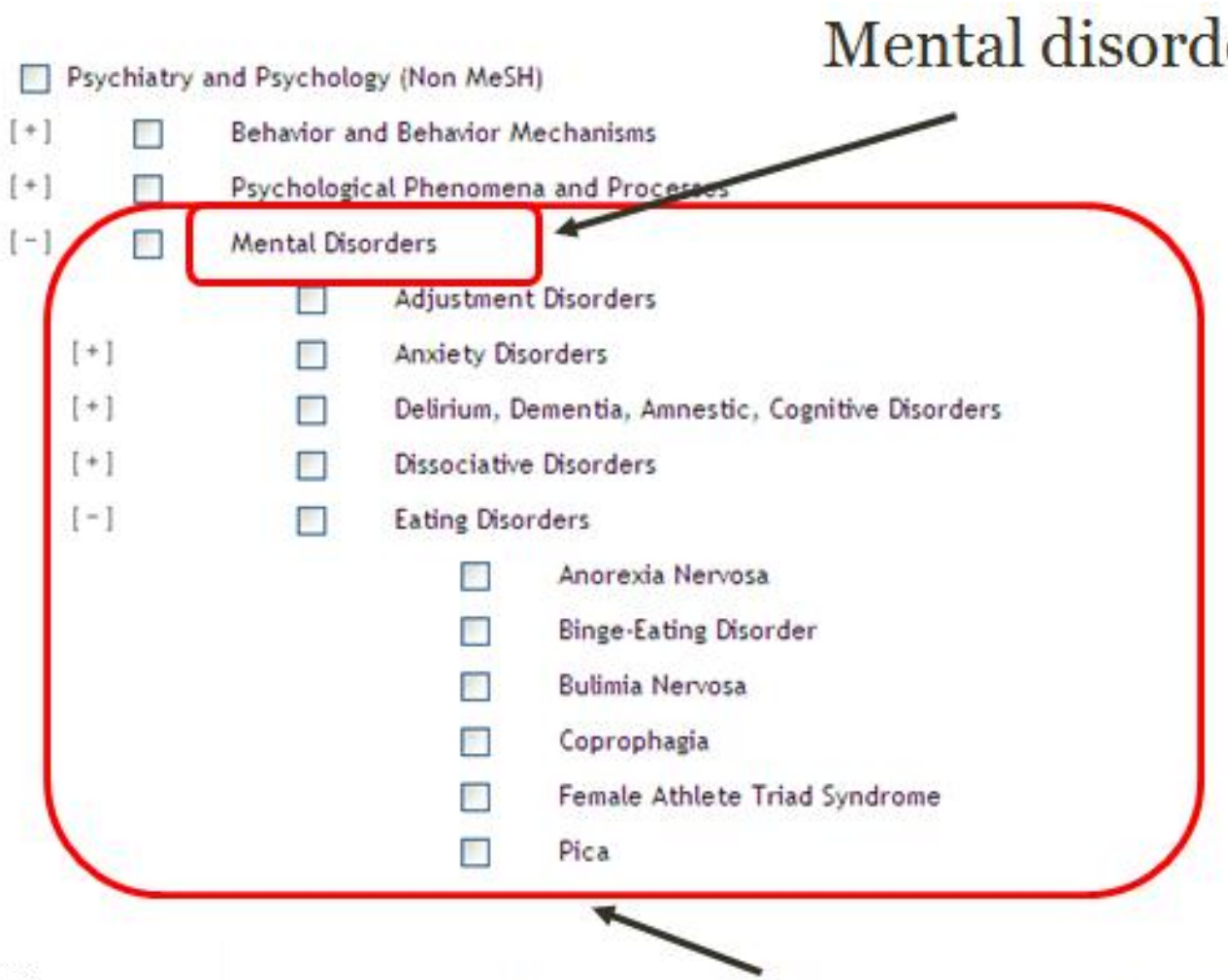
Topic Specific (Special) Queries

- Comparative Effectiveness Research
- Health Services Research (HSR) Queries
- Research Reporting Guidelines and Initiatives
- Veterinary Medicine/Animal Health

http://www.nlm.nih.gov/bsd/special_queries.html

MeSH Terms

- **Evidence Based Practice [MH]** (under *Health Occupations*)
  - Evidence-Based Dentistry
  - Evidence-Based Medicine (also listed under (Clinical Medicine)
    - Evidence-Based Emergency Medicine
  - Evidence-Based Nursing


Mental disorders
Psychiatry and Psychology (Non MeSH)
[+] Behavior and Behavior Mechanisms
[+] Psychological Phenomena and Processes
[-] Mental Disorders
Adjustment Disorders
[+] Anxiety Disorders
[+] Delirium, Dementia, Amnestic, Cognitive Disorders
[+] Dissociative Disorders
[-] Eating Disorders
Anorexia Nervosa
Binge-Eating Disorder
Bulimia Nervosa
Coprophagia
Female Athlete Triad Syndrome
Pica
Mental disorders exploded

MeSH Terms – Publication Type [PT]

- **Study Characteristics [PT]**
  - Case Reports
  - Clinical Conference
  - Clinical Trial +
  - Comparative Study
  - Census Development Conference (CDC)
    - CDC, NIH
  - Evaluation Studies
  - In Vitro
  - Meta-Analysis
  - Multicenter Study
  - Scientific Integrity Review
  - Twin Study
  - Validation Studies

MeSH Terms – Clinical Trial

- **Clinical Trial [PT]** (under *Study Characteristics*)
  - Clinical Trial, Phase I
  - Clinical Trial, Phase II
  - Clinical Trial, Phase III
  - Clinical Trial, Phase IV
  - Controlled Clinical Trial
  - Multicenter Study
  - Randomized Controlled Trial

MeSH Terms – TW/TIAB

- Useful text words – use [TW] or [TIAB]
  - Blind
  - Mask
  - Random
  - Efficacy
  - Effective (use sparingly)

MeSH Terms – Other terms

- Use [mh] for these
  - Crossover Studies
  - Cohort Studies
  - Random Allocation
  - Placebos
  - Treatment Outcome

The End of the Beginning

For More Information

- CEMB (Centre for Evidence-Based Medicine): http://www.cebm.net/
- EMB Tools (Centre for Health Evidence): http://www.cche.net/usersguides/ebm_tips.asp
- Practice Tools (HealthEvidence.org): http://www.healthevidence.org/practice-tools.aspx
- Evidence-Based Practice and Critical Appraisal (University of Auckland): http://www.fmhs.auckland.ac.nz/soph/depts/epi/epiq/ebp.aspx

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http://nnlm.gov/training/pubmedebm/

Holly Ann Burt

Outreach and Exhibits Coordinator, NN/LM GMR

Cleo Pappas

Assistant Information Services Librarian & Associate Professor, UIC LHS